REPORT

795 BRANT STREET

BURLINGTON, ON

PEDESTRIAN WIND STUDY
RWDI # 2205164
August 18, 2022

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed 795 Brant Street in Burlington, ON. The assessment was based on the wind tunnel testing conducted for the proposed development under the Existing and Proposed configurations of the site and surroundings. The results were analysed using the regional wind climate records and evaluated against the Burlington Pedestrian Wind Criteria for pedestrian comfort (pertaining to common wind speeds conducive to different levels of human activity) and pedestrian safety (pertaining to infrequent but strong gusts that could affect a person's footing). The predicted wind conditions are presented in Figures 1A through 3B, and Table 1, and are summarized as follows:

- The existing wind conditions on and around the project site are comfortable for the intended use throughout the year.

- With the addition of the proposed building, wind speeds increase on and around the site, with conditions remaining appropriate for the intended use at all areas in the summer, including the building lobby entrances. In the winter, wind speeds increase from those in the summer months due to seasonally stronger winds. As a result, higher-than-desired wind speeds are predicted near one of the lobby entrances. Additionally, uncomfortable wind conditions occur at several locations around the building, and at localized areas on the sidewalks of Prospect Street and Brant Street.

- Wind speeds on the above-grade outdoor amenity spaces are expected to be generally appropriate for the intended use in the summer, with the exception of localized areas on the southeast side of Level 7, and near the north corner of Level 8 outdoor amenity areas. Higher wind activity and uncomfortable wind conditions are predicted in the winter.

- The criterion used to assess the pedestrian wind safety is expected to be met at all locations for the Existing configuration. In the Proposed configuration, this criterion is expected to be exceeded at two locations on the northwest and southeast sides of the building, and on Level 7 outdoor amenity space.

- Satisfactory wind speeds around the proposed building, and in the outdoor amenity spaces can be achieved with various wind control measures including landscaping, wind screens, canopies, trellises/pergolas, and tall guardrails, as discussed in the report. It should be noted that the proposed landscaping features will be beneficial toward reducing the wind speeds locally around them when they are in full foliage. To extend the wind benefits of landscaping to the winter season, coniferous species and trees that retain their foliage all year round should be considered. A higher density of coniferous landscaping is recommended along Brant Street, near the main entrances on Prospect Street, and on the southeast side of the building, if feasible.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1 INTRODUCTION 1

1.1 Project Description 1

1.2 Objectives 1

2 BACKGROUND AND APPROACH 2

2.1 Wind Tunnel Study Model 2

2.2 Meteorological Data 5

2.3 Burlington Pedestrian Wind Criteria 6

2.4 General Wind Flow Mechanisms 7

3 RESULTS AND DISCUSSION 8

3.1 Grade Level (Locations 1 through 53) 8

3.1.1 Existing Configuration 8

3.1.2 Proposed Configuration 8

3.2 Outdoor Amenity Areas (Locations 54 through 75) 10

3.3 Impact of Updated Building Design 12

3.4 Impact of Landscaping Plan 13

3.4.1 Grade Level 13

3.4.2 Above-Grade Levels 13

4 STATEMENT OF LIMITATIONS 15

5 REFERENCES 17

LIST OF FIGURES

Figure 1A: Pedestrian Wind Comfort Conditions – Existing Configuration – Summer
Figure 1B: Pedestrian Wind Comfort Conditions – Proposed Configuration – Summer

Figure 2A: Pedestrian Wind Comfort Conditions – Existing Configuration – Winter
Figure 2B: Pedestrian Wind Comfort Conditions – Proposed Configuration – Winter

Figure 3A: Pedestrian Wind Safety Conditions – Existing Configuration – Annual
Figure 3B Pedestrian Wind Safety Conditions – Proposed Configuration – Annual

LIST OF TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed 795 Brant Street in Burlington, ON. This report presents the project objectives, approach, the main results from RWDI's assessment and provides conceptual wind control measures, where necessary. Our Statement of Limitations as it pertains to this study can be found in Section 4 of this report.

1.1 Project Description

The proposed development site is located at the east corner of the intersection of Brant Street and Prospect Street (Image 1). The project is a mixed-use development, consisting of 3 levels underground parking garage, ground-level retail on Brant Street, three ground-level townhouse units on Prospect Street, residential apartments on Levels 2 through 30 in the tower, and outdoor amenities on Levels 6 through 8.

1.2 Objectives

The objective of the study was to assess the effect of the proposed development on local conditions in pedestrian areas on and around the study site and provide recommendations for minimizing adverse effects, if needed. This quantitative assessment was based on wind speed measurements on a scale model of the project and its surroundings in one of RWDI's boundary-layer wind tunnels. These measurements were combined with the local wind records and compared to the Burlington Pedestrian Wind Criteria for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas, including building lobby entrances, public sidewalks, and above-grade outdoor amenity areas.



Image 1: Aerial View of the Existing Site and Surroundings (Photo Courtesy of Google™ Earth)

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment around the proposed project, a 1:300 scale model of the project site and surroundings was constructed for the wind tunnel tests of the following configurations:

A - Existing: Existing site with existing surroundings (Image 2A), and,

B - Proposed: Proposed project with existing surroundings (Image 2B).

The wind tunnel model included all relevant surrounding buildings and topography within an approximate 360 m radius around the study site. The wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were also simulated in RWDI's wind tunnel. The wind tunnel model was instrumented with 75 specially designed wind speed sensors to measure mean and gust speeds at a full-scale height of approximately 1.5 m above local grade in pedestrian areas throughout the study site. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site and reviewed by the design team. Wind speeds were measured for 36 directions in 10-degree increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model.

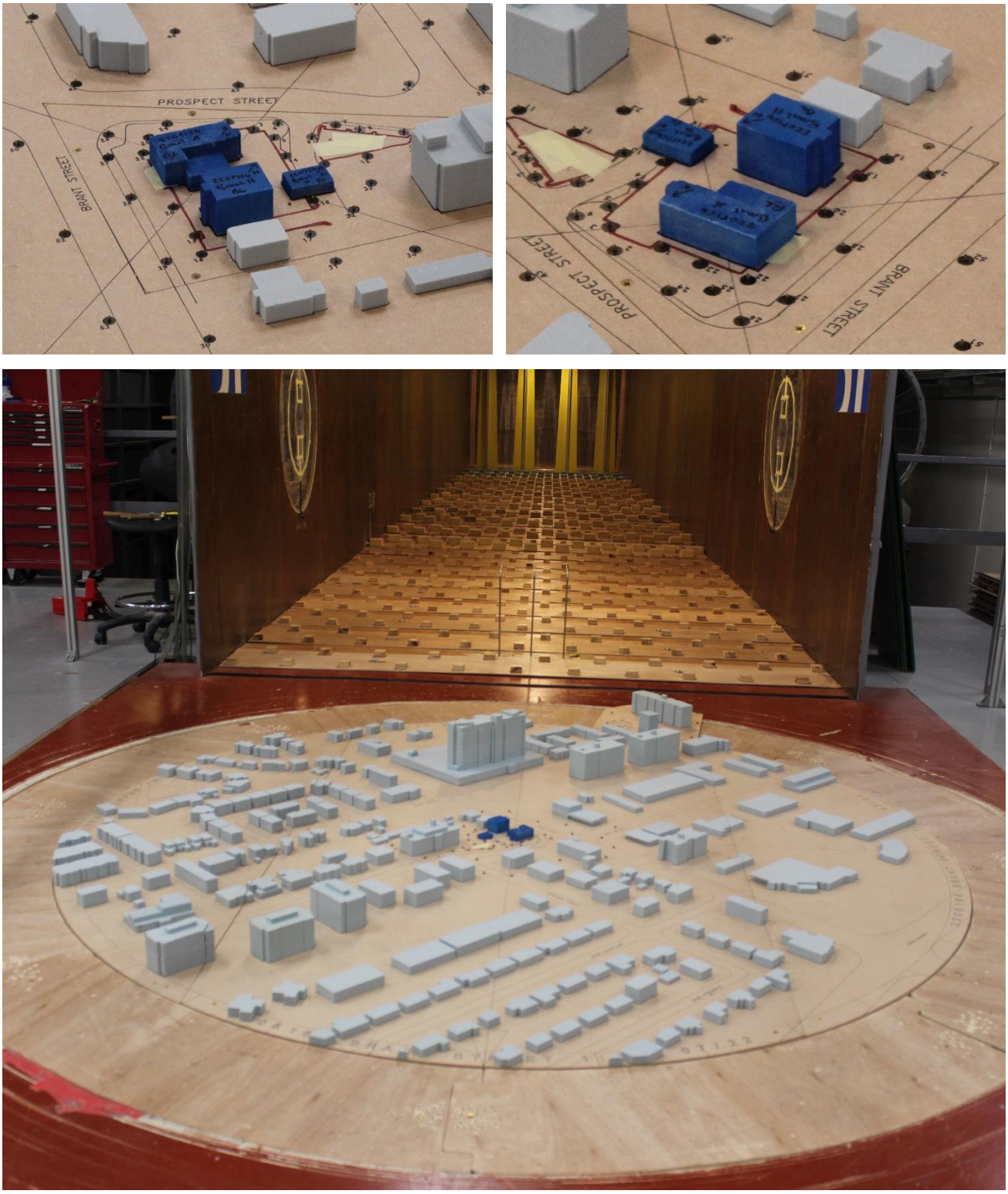


Image 2A: Wind Tunnel Study Model – Existing Configuration

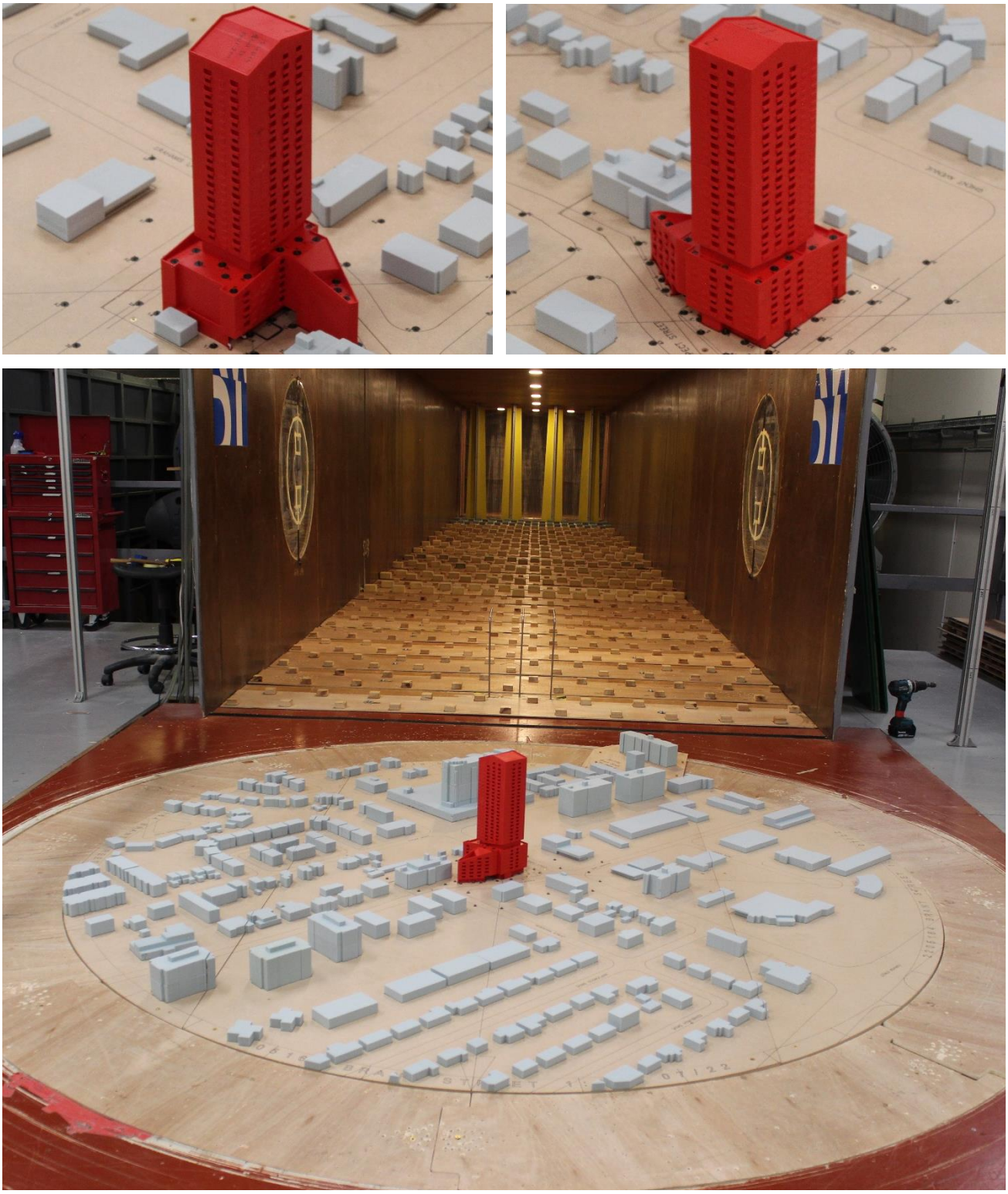
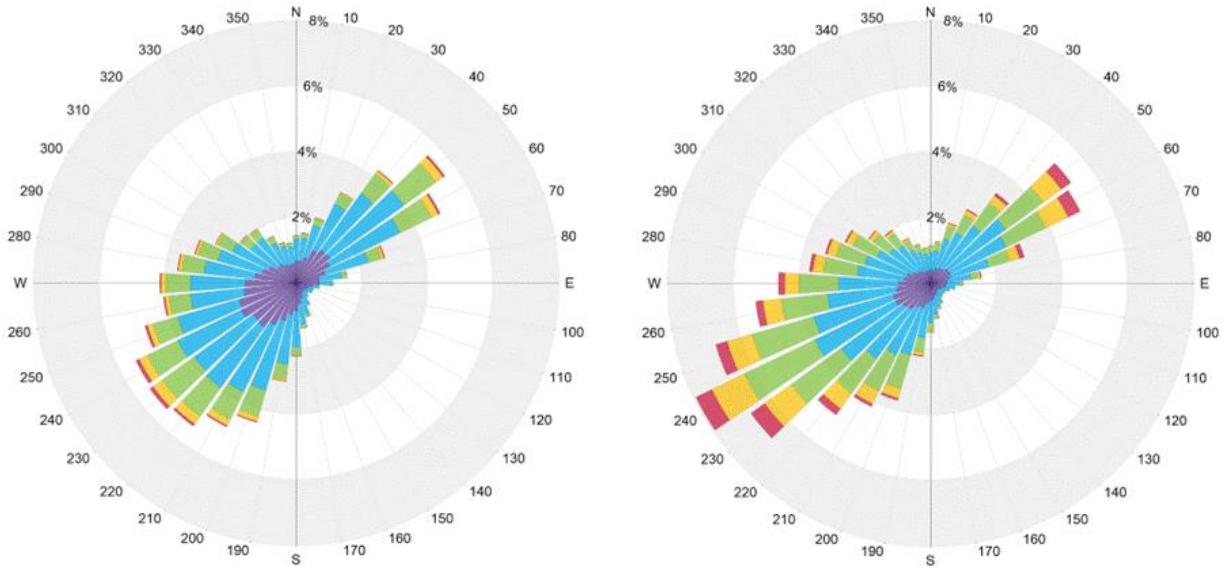


Image 2B: Wind Tunnel Study Model – Proposed Configuration

2.2 Meteorological Data

Wind statistics recorded at Hamilton International Airport between 1990 and 2020, inclusive, were analyzed for the summer (May through October) and winter (November through April) seasons. Image 3 graphically depicts the directional distributions of wind frequencies and speeds for these two seasons. Winds from the northeast and southwest directions are predominant in both summer and winter, as indicated by the wind roses. Strong winds of a mean speed greater than 30 km/h, measured at the airport (at an anemometer height of 10 m), occur for 3.8% and 12.6% of the time during the summer and winter seasons, respectively.

Wind statistics were combined with the wind tunnel data to predict the frequency of occurrence of full-scale wind speeds. The full-scale wind predictions were then compared with the wind criteria for pedestrian comfort and safety.



Wind Speed (km/h)	Probability (%) Summer	Winter
Calm	3.9	2.3
1-10	33.7	21.7
11-20	43.1	39.5
21-30	15.5	23.9
31-40	3.0	9.0
>40	0.8	3.6

Image 3: Directional Distribution of Winds Approaching Hamilton International Airport between 1990 and 2020

2.3 Burlington Pedestrian Wind Criteria

The Burlington pedestrian wind criteria, developed in March 2020, are specified in the Guidelines and Terms of Reference, "Pedestrian Level Wind Study". The following defines the criterion in detail.

Comfort Category	GEM Speed (km/h)	Description
Sitting	≤ 10	**Calm or light breezes** • Appropriate for dedicated seating areas such as cafés, patios, and outdoor amenity areas
Standing	≤ 14	**Gentle breezes** • Appropriate for main building entrances, bus stops, and other places where pedestrians may linger
Leisurely Walking	≤ 17	**Moderate winds** • Appropriate for shopping and strolling along retail streets and parks
Fast Walking	≤ 20	**Relative higher speed winds** • Appropriate for areas where pedestrians are walking, running, or cycling without lingering
Uncomfortable	> 20	**Strong winds** • Inappropriate due to nuisance for all pedestrian activities • Wind mitigation measures required

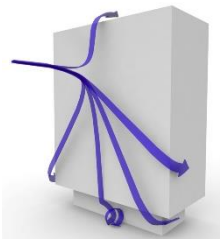
Notes:
(1) GEM is defined as the maximum mean wind speed or gust speed divided by 1.85 (whichever is larger). Gust speed can be directly measured in a wind tunnel or represented by mean wind speed + 3*RMS (Root Mean Square) wind speed.
(2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 06:00 and 23:00. The criterion has been met if the wind speeds occur at least four out of five days.

Safety Criterion	Gust Speed (km/h)	Description
Exceeded	> 90	• Excessive gust speeds • Adverse effect on pedestrian's balance and footing • Wind mitigation is required

Notes:
(1) Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day.
(2) Gust speed can be directly measured in a wind tunnel or represented by mean wind speed + 3*RMS wind speed.

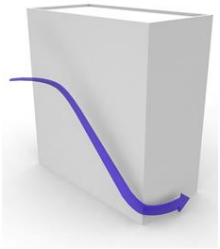
2.4 General Wind Flow Mechanisms

In our discussion of wind conditions, reference may be made to the following generalized wind flows (Image 4):



DOWNWASHING

Tall buildings tend to intercept the stronger winds at higher elevations and redirect them to the ground level. This is often the main cause for wind accelerations around large buildings at the pedestrian level.



CORNER ACCELERATION

When winds approach at an oblique angle to a tall façade and are deflected down, a localized increase in the wind activity or corner acceleration can be expected around the exposed building corners at pedestrian level.

Image 4: Generalized Wind Flows

If these building/wind combinations occur for prevailing winds, there is a greater potential for increased wind activity. Design details such as setting back a tall tower from the edges of a podium, deep canopies close to ground level, etc. can help reduce wind speeds. The use of wind screens and landscaping at grade can also help reduce wind speeds locally (Image 5). The choice and effectiveness of these measures would depend on the exposure and orientation of the site with respect to the prevailing wind directions and the size and massing of the proposed buildings.

Podium/tower setback and canopy (left to right)

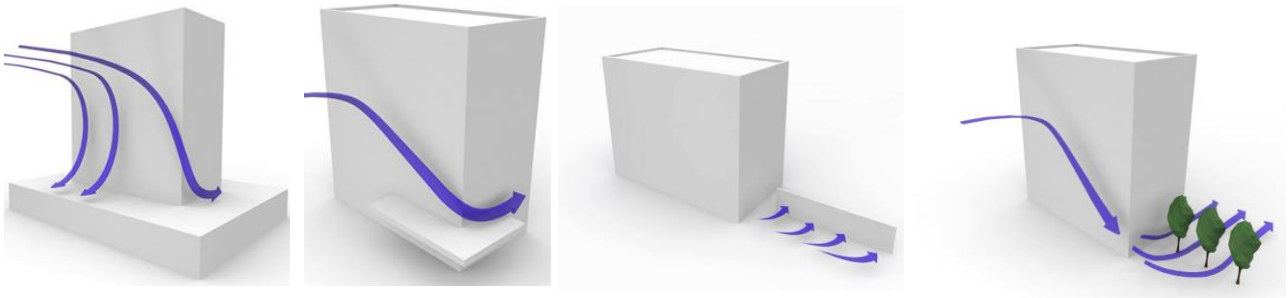


Image 5: Common Wind Control Measures

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 3B located in the "Figures" section of this report and the associated wind speeds are presented in Table 1, located in the "Tables" section of this report. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

3.1 Grade Level (Locations 1 through 53)

Wind conditions comfortable for leisurely walking or fast walking are appropriate for sidewalks and walkways as pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds, conducive to sitting or standing, are preferred at main entrances where pedestrians are apt to linger.

3.1.1 Existing Configuration

The existing wind conditions are generally comfortable for sitting or standing throughout the year (Figures 1A and 2A). In the winter, slightly higher wind speeds comfortable for leisurely walking are predicted at localized areas on the sidewalks of Prospect Street and Grahams Lane (Figure 2A). These conditions are suitable for sidewalks.

The pedestrian wind safety criterion is met at all areas assessed in the Existing configuration (Figure 3A).

3.1.2 Proposed Configuration

The addition of the proposed building to the project site is predicted to cause higher wind speeds, compared to the Existing configuration, which is primarily due to the height of the proposed building and the low surroundings in the predominant wind directions. Downwashing of the prevailing winds off the building's northeast, northwest and southwest façades will redirect winds to the ground level. These redirected winds can be relatively strong and turbulent, especially around exposed building corners (Image 4).

Wind speeds are expected to remain comfortable for sitting or standing at most locations around the proposed building, in the summer (Figure 1B). The main entrances are situated along the northwest façade (Locations 1 and 3); wind speeds near the entrances are comfortable for sitting or standing, which is suitable for the intended use. Slightly higher wind speeds comfortable for leisurely walking or fast walking are predicted, mostly near the building corners, and at localized areas on the sidewalks of Prospect Street and Brant Street. These conditions are appropriate for the intended use.

During the winter months, the seasonal wind speeds are higher, resulting in conditions comfortable for standing, leisurely walking or fast walking at most areas around the building (Figure 2B), which is considered appropriate for the intended use. However, uncomfortable wind conditions are predicted at multiple locations on the northwest (Locations 2, 4, 24, 25 and 43) and southeast (Locations 18, 29, 30 and 31) sides of the building. The uncomfortable wind conditions stem from prevailing winds downwashing from the northeast, northwest and southwest façades of the building and accelerating around the exposed corners at grade (Image 4). Due to the accelerating winds near

the corners, wind speeds comfortable for fast walking are also predicted near one of the lobby entrances (Location 1 in Figure 2B) in the winter. These wind speeds are higher than desired for a main entrance usage.

Wind conditions that meet the safety criterion are predicted at all locations assessed for the Proposed configuration (Figure 3B), expect for two localized areas on the northwest (Location 2) and southeast (Location 31) sides of the building.

To help mitigate the wind impact of the proposed building, wide canopies along the exposed façades and wrapped around the corners can help deflect downwashing winds and moderate the wind impact of the tall building. Additionally, the use of wind screens and evergreen/marcescent landscaping elements near the building corners and around the building is recommended to diffuse the energy of accelerating winds. Examples of the proposed wind control solutions are shown in Image 6. To lower wind speeds near the lobby entrance (Location 1 in Figure 2B), we recommend the placement of wind screens and/or planters on the southwest side of the entrance. Alternatively, if feasible, we recommended moving the entrance to the southwest façade, and recessing the entrance from the façade to create sheltered doorway. Examples are shown in Image 7 for reference.



Image 6: Examples of Wind Control Options Applicable for Grade Level



Image 7: Examples of Wind Control Options Applicable for the Building Entrances

3.2 Outdoor Amenity Areas (Locations 54 through 75)

It is generally desirable for wind conditions on areas intended for passive activities to be comfortable for sitting more than 80% of the time in the summer. During the winter, the area would not be used frequently, and increased wind activity would be considered appropriate.

In the summer, wind conditions comfortable for sitting or standing are predicted in most areas on the above-grade outdoor amenity spaces (Figure 1B), which is generally suitable for the intended use. Wind speeds comfortable for leisurely walking or fast walking are predicted on the southeast side of Level 7 (Locations 60, 61 and 64 in Figure 1B), and near the north corner of Level 8 (Location 71 in Figure 1B) outdoor amenity areas. Uncomfortable wind conditions are also predicted at a localized area on Level 7 amenity area (Location 63 in Figure 1B). These wind speeds are higher than desired for passive use.

In the winter, wind conditions on Level 6 are predicted to remain comfortable for sitting or standing, which is appropriate. Nonetheless, elevated wind speeds and uncomfortable wind conditions are predicted at several locations throughout the outdoor amenity areas on Levels 7 and 8 (Figure 2B), but this may not be of concern as these areas are not planned for frequent use during the colder months.

The pedestrian wind safety criterion is expected to be met at all areas assessed on Levels 6 and 8 (Figure 3B). However, the criterion is predicted to be exceeded at several locations on the southeast side of Level 7 outdoor amenity space (Locations 60, 61, 63 and 64 in Figure 3B).

Depending on the intended programming of outdoor amenity spaces, lower wind speeds in summer can be achieved by incorporating tall guardrails along the amenity perimeter. Landscaping/hardscaping features in the form of planters, screens, and trellises or pergolas are also recommended around the designated seating areas. These features should be at least 2 m tall and no more than 30% porous. The trellises or pergolas can be fixed or free-standing depending on the intended programming of the space. Examples are shown in Image 8 for reference.

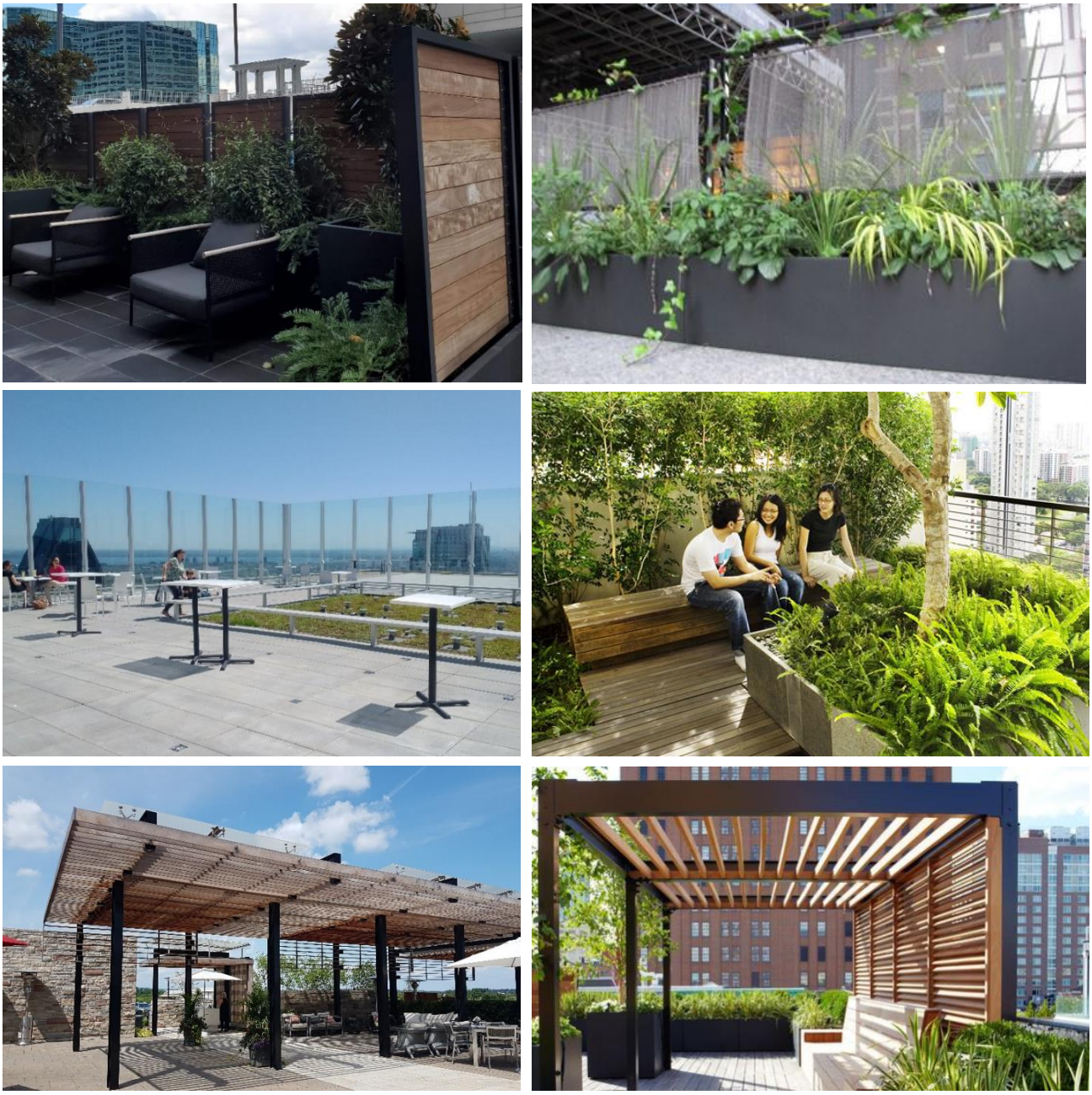


Image 8: Examples of Wind Control Options Applicable to the Outdoor Amenity Spaces

3.3 Impact of Updated Building Design

The wind tunnel results are based on the architectural drawings and 3D model received on June 20, 2022. RWDI received updated design drawings from RAW Design Inc., on July 20, 2022. Major design changes include:

- adding three extra levels of underground parking (6 levels total in the new design);
- recessing part of the northeast façade of the building (Image 9); and
- reducing the depth of the overhang above the building lobby entrances (Image 9).

With the design changes, the overall wind conditions are expected to be similar to the conditions predicted in Figures 1A through 3B. Calmer wind conditions are expected near Locations 15 and 16 due to the larger depth of the overhang in the new design. However, the lobby entrance near Location 3 in Figures 1A through 3B is now located at the north corner of the building and could be subjected to the corner acceleration of the flow passing through the breezeway/roofed passage between the tower and townhouses. With the smaller depth of the overhang, slightly higher wind speeds are also excepted near the entrances.

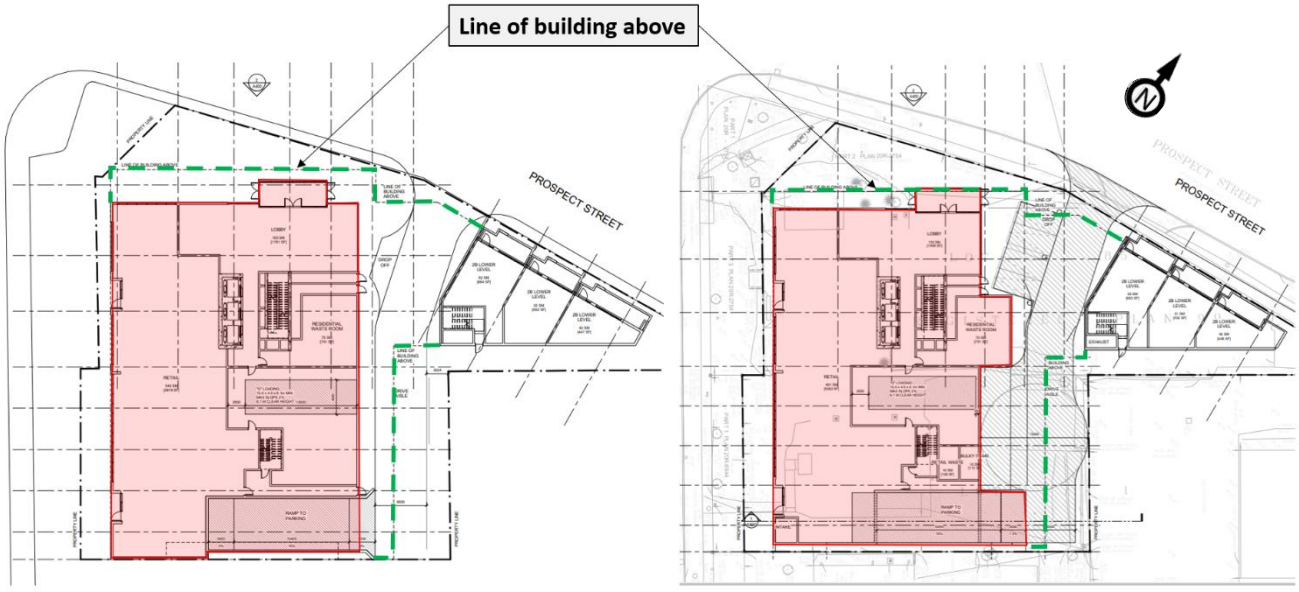


Image 9: Initial Design (Left, Received June 20, 2022) & Updated Design (Right, Received July 20, 2022)

3.4 Impact of Landscaping Plan

3.4.1 Grade Level

RWDI received a landscaping plan on August 11, 2022, which includes trees and shrubs around the building, mainly around the west corner and along Brant Street (Image 10). The proposed landscaping features will be beneficial toward reducing the wind speeds locally around them when they are in full foliage. To extend the wind benefits of landscaping to the winter season, coniferous species and trees that retain their foliage all year round should be considered. A higher density of coniferous landscaping is recommended along Brant Street, near the main entrances on Prospect Street, and on the southeast side of the building, if feasible.



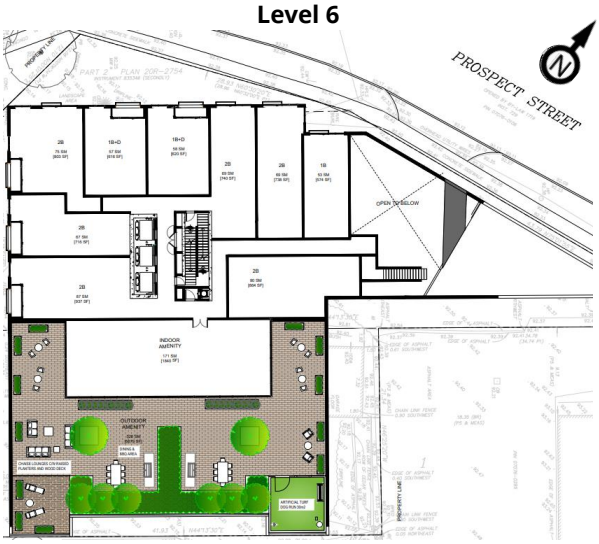
Image 10: Landscaping Plan for the Proposed Project Site (Received August 11, 2022)

3.4.2 Above-Grade Levels

The landscaping plans for the above-grade outdoor amenity areas are shown in Image 11. The proposed landscaping on the Level 6 amenity area is not expected to change the predicted wind conditions on Figures 1B and 2B since the landscaping plan includes only a plant bed. It is suggested to relocate the plant bed to the most east end of the amenity area, where wind speeds are higher (Location 54 in Figures 1B and 2B); nonetheless, this is not a concern since wind conditions on Level 6 are generally appropriate for passive uses. The proposed landscaping for Levels 7 and 8 is expected to slightly improve the predicted wind conditions in the summer season given the type of the proposed trees is deciduous. More trees are recommended near the east and south corners of the Level 7 amenity space and throughout the amenity. Also, it is recommended to slightly shift the tree on the north side of the Level 8 amenity area towards the north corner of the tower, which would help lowering the wind speeds near Location 71 (Figure 1B).



Level 6



Level 7



Level 8

Image 11: Landscaping Plan for the Above-grade Outdoor Amenity Areas (Received August 11, 2022)

4 STATEMENT OF LIMITATIONS

Limitations

This report entitled 795 Brant Street – Pedestrian Wind Study was prepared by Rowan Williams Davies & Irwin, Inc. ("RWDI") for Camarro Developments Inc. ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

Design Assumptions

RWDI confirms that the pedestrian wind assessment (the "**Assessment**") discussed herein was performed by RWDI in accordance with generally accepted professional standards at the time when the Assessment was performed and in the location of the Project. No other representations, warranties, or guarantees are made with respect to the accuracy or completeness of the information, findings, recommendations, or conclusions contained in this Report. This report is not a legal opinion regarding compliance with applicable laws.

The findings and recommendations set out in this report are based on the following information disclosed to RWDI. Drawings and information listed below were received from MHBC Planning, Urban Design & Landscape Architecture and used to construct the scale model of the 795 Brant Street **("Project Data**")

File Name	File Type	Date Received (dd/mm/yyyy)
RAW21001-795Brant-A19-Central-rz	Revit	20/06/2022
RAW21001-795Brant-ARCHITECTUREpreliminary	PDF	20/06/2022
20329 F - Landscape Plan - L1	PDF	11/08/2022
20329 F - Level 6 Outdoor Amenity Plan- L2	PDF	11/08/2022
20329 F - Level 7 Outdoor Amenity Plan - L3	PDF	11/08/2022
20329 F - Level 8 Outdoor Amenity Plan - L4	PDF	11/08/2022

The recommendations and conclusions are based on the assumption that the Project Data and Climate Data are accurate and complete. RWDI assumes no responsibility for any inaccuracy or deficiency in information it has received from others. In addition, the recommendations and conclusions in this report are partially based on historical data and can be affected by a number of external factors, including but not limited to Project design, quality of materials and construction, site conditions, meteorological events, and climate change. As such, the conclusions and recommendations contained in this report do not list every possible outcome.

The opinions in this report can only be relied up on to the extent that the Project Data and Project Specific Conditions have not changed. Any change in the Project Data or Project Specific Conditions not reflected in this report can impact and/or alter the recommendations and conclusions in this report. Therefore, it is incumbent upon the Client and/or any other third party reviewing the recommendations and conclusions in this report to contact RWDI in the event of any change in the Project Data and Project Specific Conditions in order to determine whether any such change(s) may impact the assumptions upon which the recommendations and conclusions were made.

5 REFERENCES

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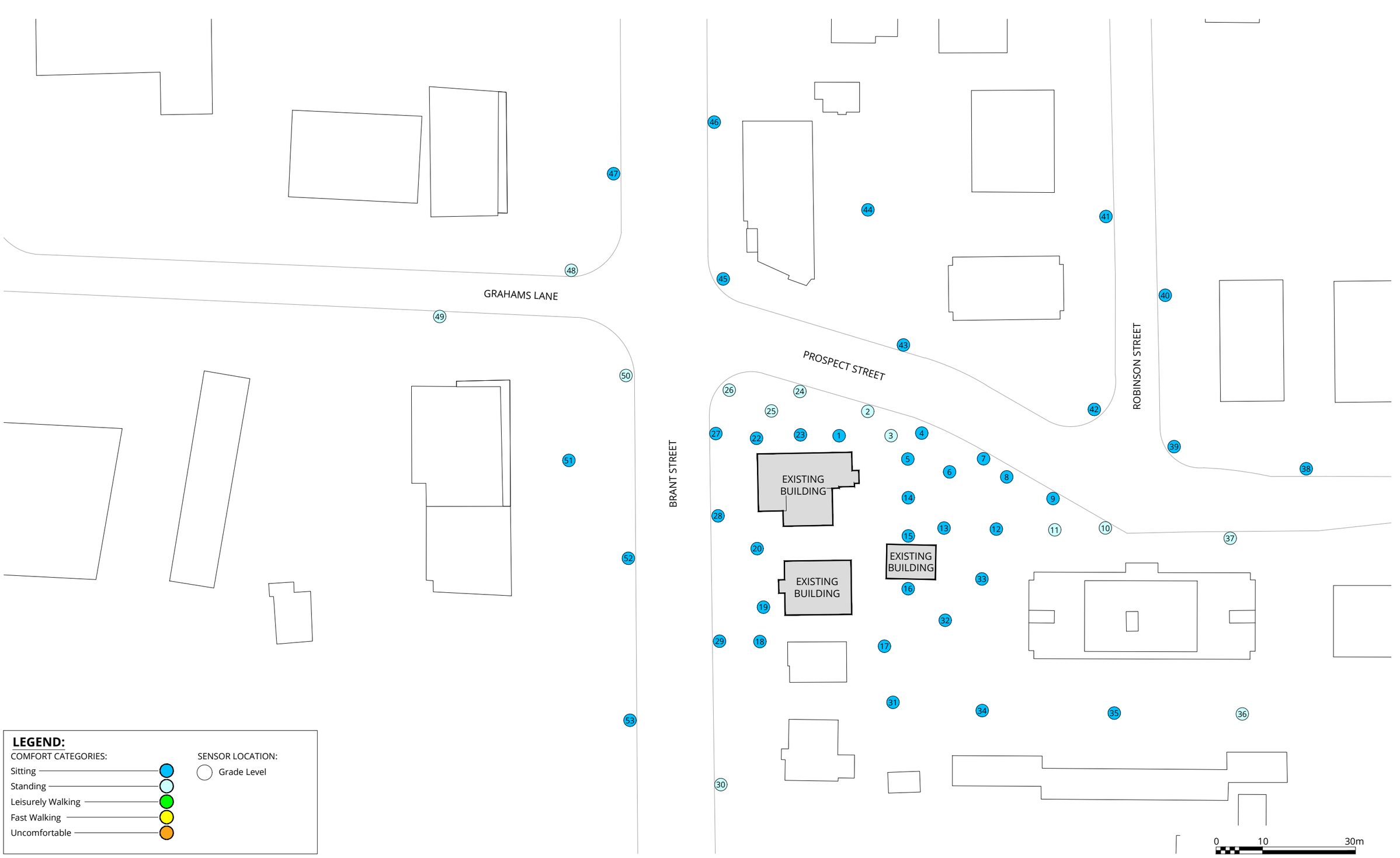
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FIGURES



LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

SENSOR LOCATION:
- Grade Level

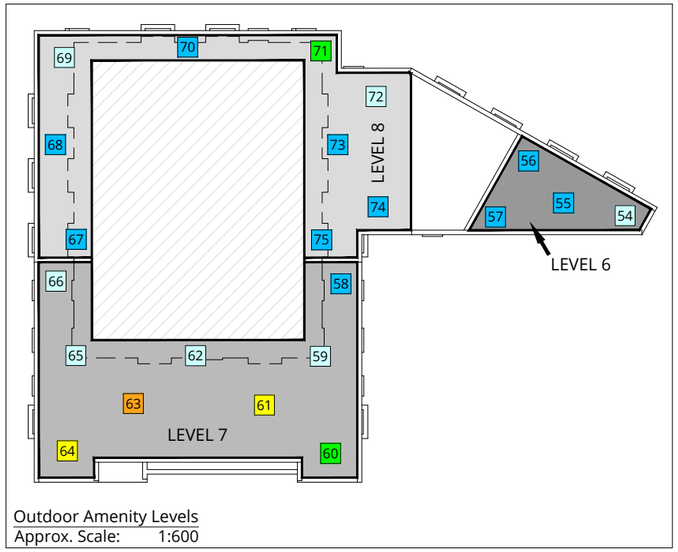
Pedestrian Wind Comfort Conditions
Existing Configuration
Summer (May to October, 6:00 to 23:00)

795 Brant Street - Burlington, ON

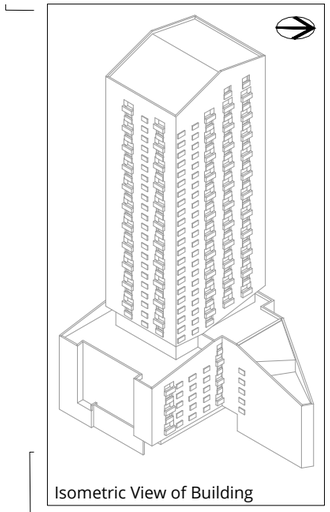
True North

Project #2205164

Drawn by:	GRE	Figure:	1A
Approx. Scale:	1:750		
Date Revised:	Jul. 25, 2022		



Outdoor Amenity Levels
Approx. Scale: 1:600



LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

SENSOR LOCATION:
- Grade Level
- Outdoor Amenity
- Entrance Location
- Building Above Removed for Clarity

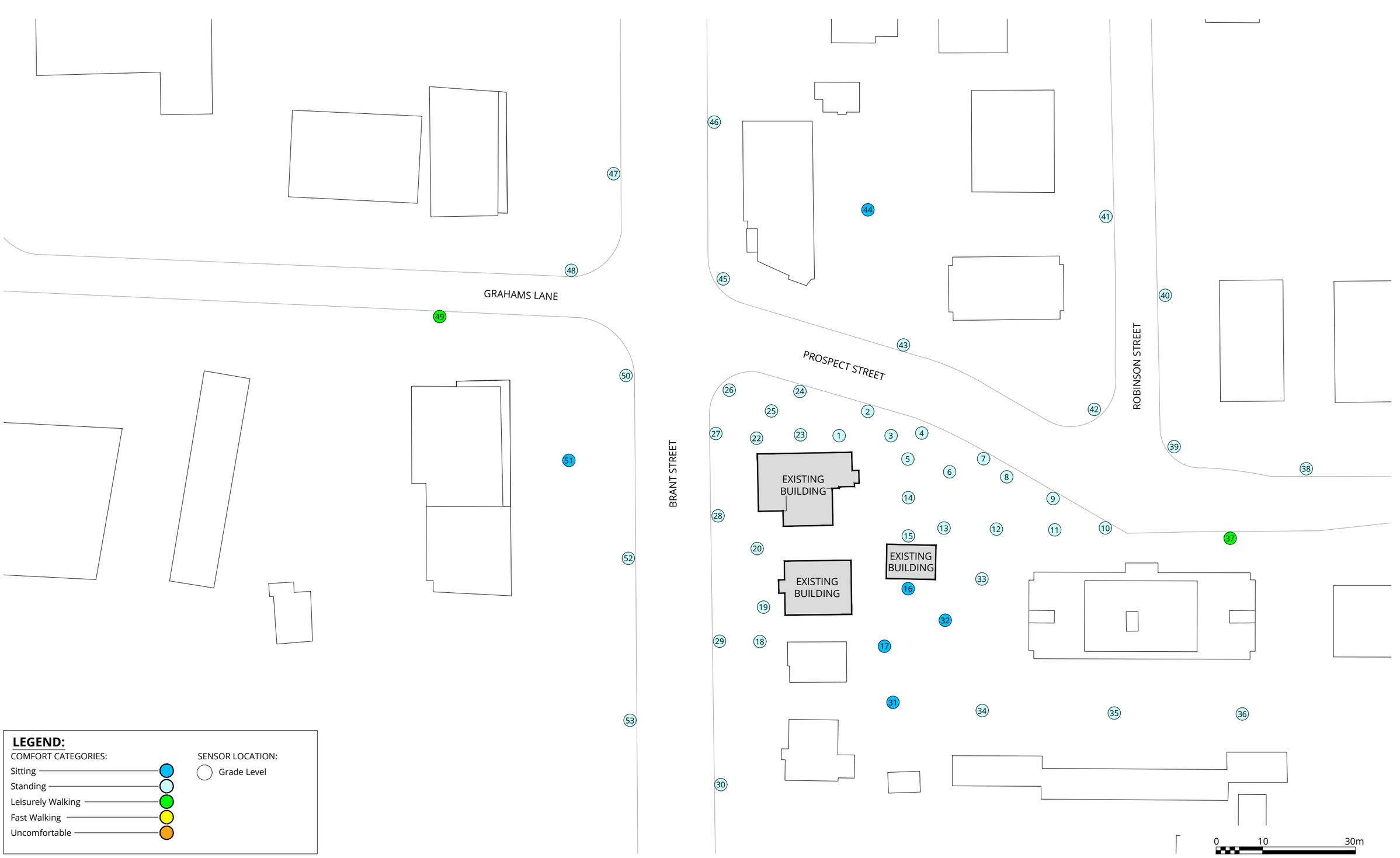
Pedestrian Wind Comfort Conditions
Proposed Configuration
Summer (May to October, 6:00 to 23:00)

795 Brant Street - Burlington, ON

True North

Project #2205164

Drawn by:	GRE	Figure:	1B
Approx. Scale:	1:750		
Date Revised:	Jul. 25, 2022		



LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

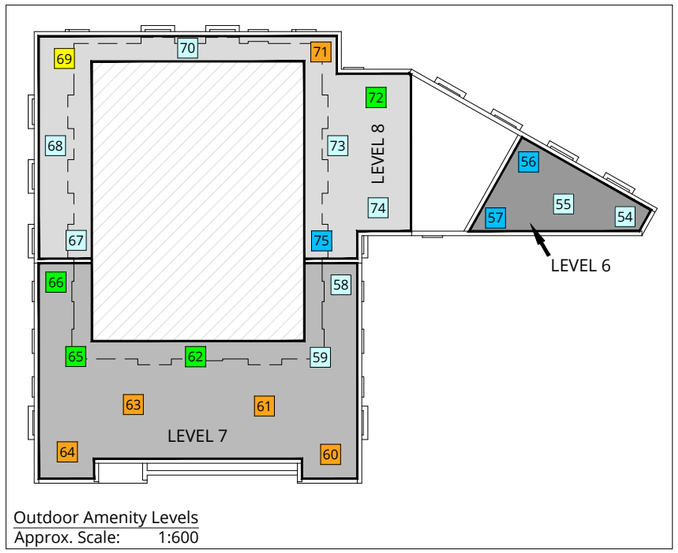
SENSOR LOCATION:
- Grade Level

Pedestrian Wind Comfort Conditions
Existing Configuration
Winter (November to April, 6:00 to 23:00)

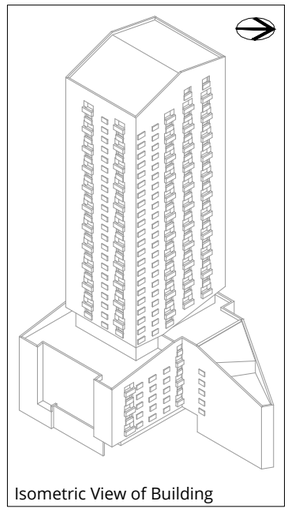
795 Brant Street - Burlington, ON

True North

Drawn by: GRE | Figure: 2A
Approx. Scale: 1:750
Project #2205164 | Date Revised: Jul. 25, 2022



Outdoor Amenity Levels
Approx. Scale: 1:600



LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Leisurely Walking
- Fast Walking
- Uncomfortable

SENSOR LOCATION:
- Grade Level
- Outdoor Amenity
- Entrance Location
- Building Above Removed for Clarity

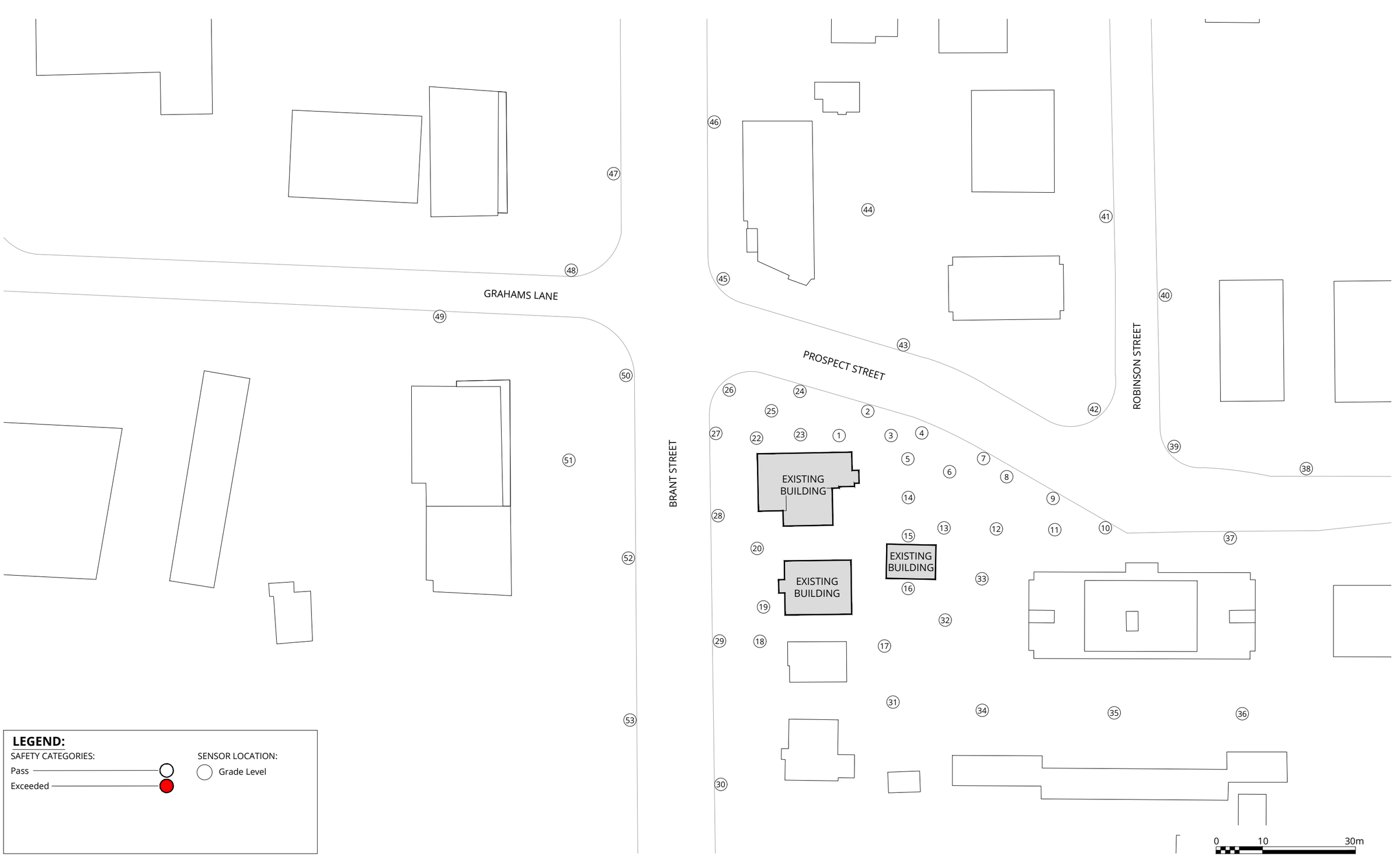
Pedestrian Wind Comfort Conditions
Proposed Configuration
Winter (November to April, 6:00 to 23:00)

795 Brant Street - Burlington, ON

True North

Project #2205164

Drawn by:	GRE	Figure:	2B
Approx. Scale:	1:750		
Date Revised:	Jul. 25, 2022		



LEGEND:

SAFETY CATEGORIES:
- Pass
- Exceeded

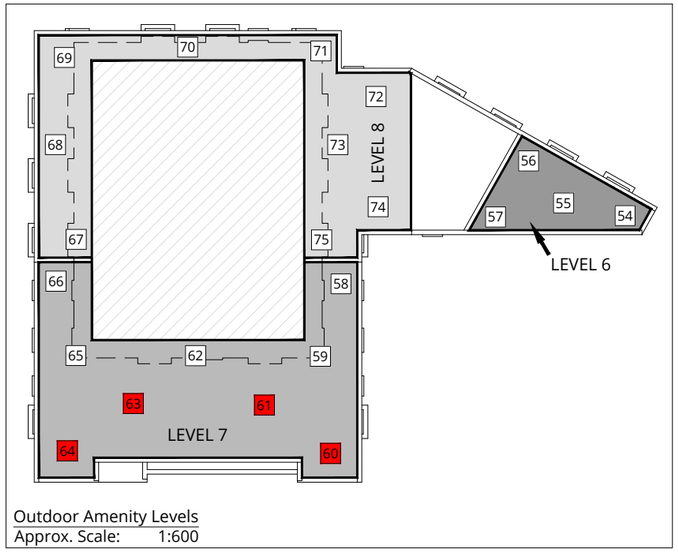
SENSOR LOCATION:
- Grade Level

Pedestrian Wind Safety Conditions
Existing Configuration
Annual (January to December, 0:00 to 23:00)

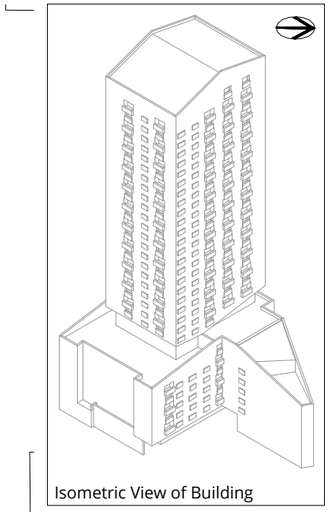
795 Brant Street - Burlington, ON

True North

Drawn by: GRE | Figure: 3A
Approx. Scale: 1:750
Project #2205164 | Date Revised: Jul. 25, 2022



Outdoor Amenity Levels
Approx. Scale: 1:600



Isometric View of Building

LEGEND:

SAFETY CATEGORIES:
- Pass
- Exceeded

SENSOR LOCATION:
- Grade Level
- Outdoor Amenity
- Entrance Location
- Building Above Removed for Clarity

Pedestrian Wind Safety Conditions
Proposed Configuration
Annual (January to December, 0:00 to 23:00)

795 Brant Street - Burlington, ON

True North

Project #2205164

Drawn by:	GRE	Figure:	3B
Approx. Scale:	1:750		
Date Revised:	Jul. 25, 2022		

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
1	Existing	10	Sitting	13	Standing	51	Pass
	Proposed	14	Standing	18	Fast Walking	63	Pass
2	Existing	11	Standing	14	Standing	58	Pass
	Proposed	17	Leisurely Walking	22	Uncomfortable	93	Exceeded
3	Existing	11	Standing	14	Standing	54	Pass
	Proposed	10	Sitting	12	Standing	58	Pass
4	Existing	10	Sitting	13	Standing	53	Pass
	Proposed	15	Leisurely Walking	21	Uncomfortable	82	Pass
5	Existing	9	Sitting	12	Standing	51	Pass
	Proposed	13	Standing	16	Leisurely Walking	85	Pass
6	Existing	9	Sitting	12	Standing	50	Pass
	Proposed	10	Sitting	13	Standing	59	Pass
7	Existing	10	Sitting	12	Standing	53	Pass
	Proposed	11	Standing	16	Leisurely Walking	75	Pass
8	Existing	9	Sitting	12	Standing	57	Pass
	Proposed	8	Sitting	10	Sitting	43	Pass
9	Existing	10	Sitting	12	Standing	57	Pass
	Proposed	11	Standing	15	Leisurely Walking	65	Pass
10	Existing	11	Standing	14	Standing	59	Pass
	Proposed	12	Standing	15	Leisurely Walking	67	Pass
11	Existing	11	Standing	14	Standing	58	Pass
	Proposed	13	Standing	17	Leisurely Walking	75	Pass
12	Existing	10	Sitting	12	Standing	55	Pass
	Proposed	11	Standing	14	Standing	59	Pass
13	Existing	9	Sitting	12	Standing	52	Pass
	Proposed	13	Standing	17	Leisurely Walking	81	Pass
14	Existing	9	Sitting	12	Standing	51	Pass
	Proposed	15	Leisurely Walking	17	Leisurely Walking	88	Pass
15	Existing	8	Sitting	11	Standing	45	Pass
	Proposed	12	Standing	14	Standing	65	Pass
16	Existing	6	Sitting	8	Sitting	30	Pass
	Proposed	13	Standing	15	Leisurely Walking	66	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
17	Existing	8	Sitting	10	Sitting	43	Pass
	Proposed	9	Sitting	12	Standing	60	Pass
18	Existing	8	Sitting	11	Standing	43	Pass
	Proposed	18	Fast Walking	24	Uncomfortable	88	Pass
19	Existing	9	Sitting	11	Standing	45	Pass
	Proposed	12	Standing	16	Leisurely Walking	66	Pass
20	Existing	10	Sitting	12	Standing	48	Pass
	Proposed	9	Sitting	12	Standing	52	Pass
21	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	10	Sitting	47	Pass
22	Existing	10	Sitting	13	Standing	53	Pass
	Proposed	15	Leisurely Walking	19	Fast Walking	77	Pass
23	Existing	10	Sitting	13	Standing	49	Pass
	Proposed	12	Standing	16	Leisurely Walking	72	Pass
24	Existing	11	Standing	14	Standing	60	Pass
	Proposed	19	Fast Walking	24	Uncomfortable	90	Pass
25	Existing	11	Standing	14	Standing	57	Pass
	Proposed	17	Leisurely Walking	21	Uncomfortable	85	Pass
26	Existing	11	Standing	14	Standing	55	Pass
	Proposed	16	Leisurely Walking	20	Fast Walking	80	Pass
27	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	16	Leisurely Walking	20	Fast Walking	79	Pass
28	Existing	9	Sitting	12	Standing	46	Pass
	Proposed	13	Standing	16	Leisurely Walking	72	Pass
29	Existing	10	Sitting	12	Standing	50	Pass
	Proposed	16	Leisurely Walking	22	Uncomfortable	78	Pass
30	Existing	11	Standing	14	Standing	54	Pass
	Proposed	16	Leisurely Walking	21	Uncomfortable	80	Pass
31	Existing	8	Sitting	10	Sitting	51	Pass
	Proposed	17	Leisurely Walking	22	Uncomfortable	93	Exceeded
32	Existing	8	Sitting	10	Sitting	43	Pass
	Proposed	13	Standing	16	Leisurely Walking	72	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
33	Existing	10	Sitting	13	Standing	53	Pass
	Proposed	13	Standing	16	Leisurely Walking	75	Pass
34	Existing	10	Sitting	13	Standing	56	Pass
	Proposed	13	Standing	17	Leisurely Walking	72	Pass
35	Existing	10	Sitting	13	Standing	58	Pass
	Proposed	11	Standing	15	Leisurely Walking	62	Pass
36	Existing	11	Standing	14	Standing	55	Pass
	Proposed	12	Standing	15	Leisurely Walking	62	Pass
37	Existing	12	Standing	16	Leisurely Walking	71	Pass
	Proposed	12	Standing	15	Leisurely Walking	64	Pass
38	Existing	10	Sitting	13	Standing	54	Pass
	Proposed	10	Sitting	13	Standing	54	Pass
39	Existing	10	Sitting	13	Standing	54	Pass
	Proposed	12	Standing	16	Leisurely Walking	65	Pass
40	Existing	9	Sitting	12	Standing	46	Pass
	Proposed	10	Sitting	12	Standing	52	Pass
41	Existing	10	Sitting	13	Standing	50	Pass
	Proposed	11	Standing	14	Standing	57	Pass
42	Existing	10	Sitting	13	Standing	51	Pass
	Proposed	14	Standing	18	Fast Walking	77	Pass
43	Existing	10	Sitting	13	Standing	55	Pass
	Proposed	17	Leisurely Walking	22	Uncomfortable	78	Pass
44	Existing	7	Sitting	9	Sitting	37	Pass
	Proposed	9	Sitting	12	Standing	52	Pass
45	Existing	10	Sitting	13	Standing	56	Pass
	Proposed	11	Standing	13	Standing	58	Pass
46	Existing	10	Sitting	12	Standing	47	Pass
	Proposed	11	Standing	14	Standing	60	Pass
47	Existing	9	Sitting	11	Standing	47	Pass
	Proposed	10	Sitting	12	Standing	61	Pass
48	Existing	11	Standing	14	Standing	58	Pass
	Proposed	11	Standing	13	Standing	61	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
49	Existing	12	Standing	16	Leisurely Walking	62	Pass
	Proposed	11	Standing	14	Standing	54	Pass
50	Existing	11	Standing	14	Standing	59	Pass
	Proposed	13	Standing	16	Leisurely Walking	78	Pass
51	Existing	8	Sitting	10	Sitting	41	Pass
	Proposed	11	Standing	13	Standing	64	Pass
52	Existing	9	Sitting	11	Standing	49	Pass
	Proposed	16	Leisurely Walking	19	Fast Walking	86	Pass
53	Existing	10	Sitting	13	Standing	52	Pass
	Proposed	14	Standing	18	Fast Walking	72	Pass
54	Existing	-	-	-	-	-	-
	Proposed	11	Standing	14	Standing	62	Pass
55	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	55	Pass
56	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	10	Sitting	46	Pass
57	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	10	Sitting	53	Pass
58	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	65	Pass
59	Existing	-	-	-	-	-	-
	Proposed	12	Standing	14	Standing	79	Pass
60	Existing	-	-	-	-	-	-
	Proposed	17	Leisurely Walking	21	Uncomfortable	100	Exceeded
61	Existing	-	-	-	-	-	-
	Proposed	19	Fast Walking	24	Uncomfortable	102	Exceeded
62	Existing	-	-	-	-	-	-
	Proposed	13	Standing	15	Leisurely Walking	84	Pass
63	Existing	-	-	-	-	-	-
	Proposed	22	Uncomfortable	29	Uncomfortable	108	Exceeded
64	Existing	-	-	-	-	-	-
	Proposed	19	Fast Walking	25	Uncomfortable	102	Exceeded

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
65	Existing	-	-	-	-	-	-
	Proposed	12	Standing	15	Leisurely Walking	80	Pass
66	Existing	-	-	-	-	-	-
	Proposed	12	Standing	16	Leisurely Walking	74	Pass
67	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	11	Standing	62	Pass
68	Existing	-	-	-	-	-	-
	Proposed	9	Sitting	12	Standing	53	Pass
69	Existing	-	-	-	-	-	-
	Proposed	14	Standing	18	Fast Walking	71	Pass
70	Existing	-	-	-	-	-	-
	Proposed	9	Sitting	12	Standing	54	Pass
71	Existing	-	-	-	-	-	-
	Proposed	17	Leisurely Walking	22	Uncomfortable	90	Pass
72	Existing	-	-	-	-	-	-
	Proposed	13	Standing	16	Leisurely Walking	72	Pass
73	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	66	Pass
74	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	61	Pass
75	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	10	Sitting	50	Pass

Season	Months	Hours
Summer	May - October	6:00 - 23:00 for comfort
Winter	November - April	6:00 - 23:00 for comfort
Annual	January - December	0:00 - 23:00 for safety
Configurations		
Existing	Existing site and surroundings	
Proposed	Project with existing surroundings	

Comfort Speed (km/h)	
(20% Seasonal Exceedance)	
≤ 10	Sitting
11 - 14	Standing
15 - 17	Leisurely Walking
18 - 20	Fast Walking
> 20	Uncomfortable

Safety Speed (km/h)	
(0.1% Annual Exceedance)	
≤ 90	Pass
> 90	Exceeded